

What Floats Your Boat? A Study of Buoyancy

You probably know something already about sinking and floating. How can a giant steel ship weighing thousands of tons float? Jot down some thoughts below.

What do you think happens to the apparent weight of an object as it is slowly submerged in water? Remember that weight is a force caused by the pull of gravity on an object. Sketch what you think a graph of Apparent Weight vs. Depth submerged would look like. Explain why you drew the graph the way you did.

Data Collection:

1. Connect the Force Probe to Channel 1
2. Configure your experiment using **Events with Entry** mode. The event will be **Depth** and the unit will be **cm**.
3. Zero the Force Probe
4. Hang the container on the Force Probe and begin collecting data. Be sure and take a reading out of the water.
5. Take readings as you slowly submerge the container in water. Be sure and Stop the experiment when you are finished collecting data.

Draw a sketch of the actual graph and explain what it means. Run a curve fit to determine the mathematical model that describes this data.

Figure the buoyant force exerted by the water at each depth and record in the table below. You can also use a Calculated Column in Logger Pro or the LabQuest to figure buoyant force.

Depth Submerged	Apparent Weight	Buoyant Force

Buoyant force is a force exerted by the water that tends to “buoy” or lift up on an object submerged in the water. The reading in the air (0 depth) represents the actual weight of the vessel. The apparent change in weight as an object is submerged is caused by the buoyant (upward) force exerted by the water. **An object floats when the buoyant force and the actual weight of the object become equal.**

Plot a graph of buoyant force vs. depth submerged. Sketch the graph below. Run a curve fit to determine the mathematical model/function that best fits your data. Explain in your own words the physical meaning of the function.

If you don’t hold it up, should your vessel sink or float? Explain why.

Did you notice anything about the water level in the other container as you submerged the vessel? If not, lower the vessel again into the water and observe carefully. What did you see?

A submarine can’t change its shape, yet it can either sink or float. How can it do this?